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CASE REPORT

# Segmental artery injury during transforaminal percutaneous endoscopic lumbar discectomy: Two case reports

Wan-Jae Cho, Ki-Won Kim, Hyung-Youl Park, Bo-Hyoung Kim, Jun-Seok Lee

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**Wan-Jae Cho, Ki-Won Kim, Bo-Hyoung Kim,** Department of Orthopedic Surgery, Yeouido St. Mary's Hospital, College of Medicine, Catholic University of Korea, Seoul 07345, South Korea

**Hyung-Youl Park, Jun-Seok Lee,** Department of Orthopedic Surgery, Eunpyeong St. Mary's Hospital, College of Medicine, Catholic University of Korea, Seoul 03312, South Korea

**Corresponding author:** Jun-Seok Lee, MD, PhD, Professor, Department of Orthopedic Surgery, Eunpyeong St. Mary's Hospital, College of Medicine, Catholic University of Korea, No. 1021 Tongil-Ro, Eunpyeong-gu, Seoul 03312, South Korea. junband@naver.com

## Abstract

### *BACKGROUND*

Since Kambin experimentally induced arthroscopy to treat herniated nucleus pulposus, percutaneous endoscopic lumbar discectomy (PELD) has been developed. The branch of the segmental artery around the neural foramen may be damaged during PELD using the transforaminal approach. We report 2 rare cases in which segmental artery injury that occurred during PELD was treated with emergency embolization.

### *CASE SUMMARY*

In case 1, a 31-year-old man was transferred to our emergency department with left lower quadrant abdominal pain after PELD at a local hospital. Lumbar spine magnetic resonance imaging after the surgery showed a hematoma of the left retroperitoneal area and the psoas muscle area. Under suspicion of vascular injury, arteriography was performed. Pseudoaneurysm and blood leakage from the left 4th lumbar segmental artery into the abdominal cavity were identified. Emergency transarterial embolization was performed using fibered microcoils for bleeding of the segmental artery. In case 2, a 75-year-old woman was transferred to our emergency department with low blood pressure, right flank pain, and drowsy mental status after PELD at a local hospital. When the patient arrived at the emergency room, the blood pressure decreased from 107/55 mmHg to 72/47 mmHg. Low blood pressure persisted. Under suspicion of vessel injury, arteriography was performed, and the right 4th lumbar segmental artery rupture was confirmed. Emergency transarterial embolization was performed for bleeding of segmental artery.

### *CONCLUSION*

We were able to find the bleeding focus by angiography and treat the injury of the segmental artery successfully through emergency transarterial embolization.

**Key Words:** Percutaneous endoscopic lumbar discectomy; Segmental artery injury; Transarterial embolization; Angiography; Case report



**Core Tip:** The branch of the segmental artery around the neural foramen may be damaged during percutaneous endoscopic lumbar discectomy using the transforaminal approach. When segmental artery rupture is suspected, angiography is helpful in finding the bleeding focus, and emergency embolization is considered an effective treatment method. In our 2 cases, clear bleeding focus was found by angiography, and the bleeding was controlled successfully through emergency transarterial embolization.

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## INTRODUCTION

After the endoscope was developed, it began to be actively used in the field of spinal surgery. Since Pan *et al*[1] experimentally induced arthroscopy to treat herniated nucleus pulposus, percutaneous endoscopic lumbar discectomy (PELD) has been developed. PELD has several advantages, including less paravertebral muscle injury, preservation of bony structure, and rapid recovery[2]. On the other hand, surgery-related complications of PELD including dural tear, intervertebral infection, hypoesthesia, bleeding, and recurrence are common[1]. Lumbar segmental arteries originate from the aorta and primarily distribute on the lateral surface of the vertebrae, forming an extensive arterial network that feeds the nerve root, vertebral body, and associated muscles or extradural structures[3]. The segmental artery branches into the intercostal branch, muscular branch, and spinal artery near the neural foramen [4]. Of these, spinal arteries enter the vertebral canal and divide into postcentral, prelaminar, and radicular branches[5]. The branch of the segmental artery around the neural foramen may be damaged during PELD using a transforaminal approach. Here we report 2 rare cases of segmental artery injury during PELD.

## CASE PRESENTATION

### *Chief complaints*

**Case 1**: A 31-year-old man presented with left lower quadrant abdominal pain after PELD at a local hospital.

**Case 2**: A 75-year-old woman presented with low blood pressure, right flank pain, and drowsy mental status after PELD at a local hospital.

### *History of present illness*

**Case 1:** He was transferred to the emergency department at our hospital 17 h after surgery. When the patient arrived at the emergency room, the abdominal pain worsened.

**Case 2:** She was transferred to the emergency department of our hospital 8 h after surgery. When the patient arrived at the emergency room, her blood pressure decreased from 107/55 mmHg to 72/47 mmHg. Her low blood pressure persisted.

### *History of past illness*

**Case 1:** The patient was medically healthy without taking any medications.

**Case 2:** The patient had diabetes mellitus, hypertension, and hyperlipidemia as comorbidities.

### *Personal and family history*

**Cases 1 and 2**: There were no specific family health histories.

### *Physical examination*

**Case 1***:* Tenderness in the left lower quadrant area was observed. He had no neurologic deficit.

**Case 2:** There was no neurologic deficit other than the right flank pain.

### *Laboratory examinations*

**Case 1**: When the patient arrived at the emergency room, laboratory investigations revealed low levels of hemoglobin (11.9 g/dL, normal range: 14.0-18.0 g/dL) with low levels of hematocrit (35.0%, normal range: 42.0%-52.0%). White blood cell count was 10.65 × $10^9$/L (normal range: 4.0-10.0 × $10^9$/L), and platelet count was 170 × $10^9$/L (normal range: 150-450 × $10^9$/L). At 2 h after arrival, follow-up laboratory investigations showed rapidly decreasing hemoglobin (10.0 g/dL) and hematocrit (29.2%).

Coagulation function test revealed: prothrombin time (PT), 10.3 s (normal range: 9.7-13.3 s); PT%, 106.1% (normal range: 77%-120%); international normalized ratio, 0.97 (normal range: 0.88-1.20); and activated partial thromboplastin time, 24.9 s (normal range: 23.1-37.3 s). These results were all within normal ranges.

**Case 2**: When the patient arrived at the emergency room, laboratory investigations revealed low levels of hemoglobin (9.4 g/dL, normal range: 12.0-16.0 g/dL) with low levels of hematocrit (27.5%, normal range: 37.0%-47.0%). White blood cell count was 15.52 × $10^9$/L (normal range: 4.0-10.0 × $10^9$/L), and platelet count was 170 × $10^9$/L (normal range: 150 - 450 × $10^9$/L).

Coagulation function test revealed: PT, 10.7 s (normal range: 9.7-13.3s); PT%, 93.4% (normal range: 77%-120%); international normalized ratio, 1.03 (normal range: 0.88-1.20); and activated partial thromboplastin time: 20.4 s (normal range: 23.1-37.3 s). These results were all within normal ranges.

### *Imaging examinations*

**Case 1:** Lumbar spine magnetic resonance imaging after the surgery showed hematoma of the left retroperitoneal area and the psoas muscle area (Figures 1 and 2).

**Case 2**: Computed tomography scan of the abdomen aorta showed hemorrhage in the right retroperitoneal area without a clear bleeding focus (Figure 3A and B).

## FINAL DIAGNOSIS

### *Case 1*

Pseudoaneurysm and blood leakage from the left 4th lumbar segmental artery into the abdominal cavity were identified by arteriography (Figure 2A).

### *Case 2*

The right 4th lumbar segmental artery rupture was confirmed by arteriography (Figure 4).

## TREATMENT

### *Cases 1 and 2*

Emergency transarterial embolization was performed using fibered microcoils for bleeding of the segmental artery (Figure 2B).

## OUTCOME AND FOLLOW-UP

### *Case 1*

After the embolization, the pain improved. The patient was discharged in a tolerable state in the 1$^{st}$ wk after the procedure.

### *Case 2*

After the procedure, the patient's flank pain improved. Her vital signs were stable. The patient was discharged in a tolerable state on the 4$^{th}$ d after the procedure.

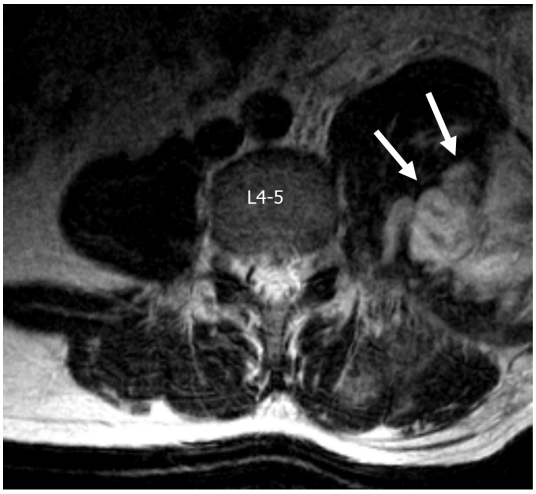


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**Figure 1 Axial T2-weighted magnetic resonance image scan of the lumbar spine showed left psoas muscle hematoma (arrows).**

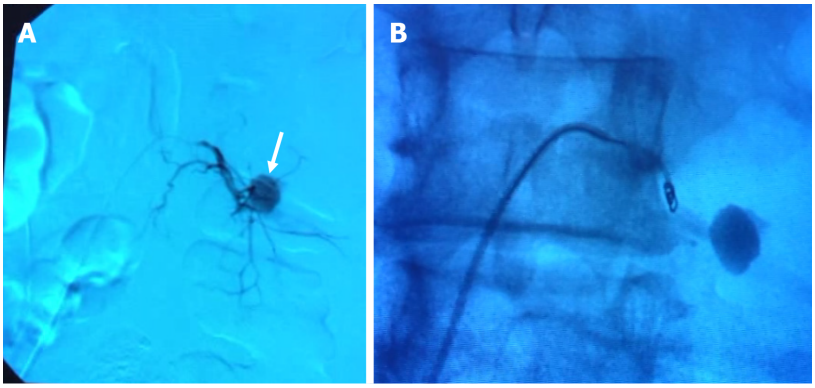


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**Figure 2 Arteriography.** A: Arteriography showed pseudoaneurysm (arrow) of the left 4th lumbar segmental artery; B: Arteriography of embolization using microcoils.

## DISCUSSION

PELD can be broadly divided into percutaneous endoscopic transforaminal discectomy and percutaneous endoscopic interlaminar discectomy, which have different characteristics and indications depending on the surgical approach[6]. Huang *et al*[6] revealed that percutaneous endoscopic interlaminar discectomy had a shorter operation time, decreased intraoperative blood loss, and lower fluoroscopy times compared with percutaneous endoscopic transforaminal discectomy for treating herniation of nucleus pulposus. The percutaneous endoscopic interlaminar discectomy approach is familiar to surgeons because its anatomical orientations are similar to open surgery. Microscopic vision is also easier. However, since the transforaminal approach has different anatomical similarities to open surgery, it may be difficult to perform the technique.

We found a total of 7 cases of vessel injury that occurred during PELD[7-10]. In 6 of the 7 cases, vessel injury occurred during a transforaminal approach. Our 2 cases also had a segmental artery injury during transforaminal PELD. The segmental artery branches into the intercostal branch, muscular branch, and spinal artery near the neural foramen. Accordingly, during a transforaminal approach, the guide wire may come close to the branch of the segmental artery, causing injury. During guide wire insertion before reaching the disc, the guide tip should be placed behind the posterior vertebral line to avoid damage to the segmental artery terminal branch[7]. In the extraforaminal area, the arterial branches are complex, and care must be taken because vascular damage may occur during exploration [7]. If blood vessel damage is found, hemostasis can be attempted by electrocautery or compressing a gelatin sponge. If bleeding persists even after trying the above method, an artery injury is suspected, and transarterial embolization can be performed as in our cases. Complications of transarterial embolization include contrast reaction, vascular injury, and coil migration, but the incidence is known to be low[11].

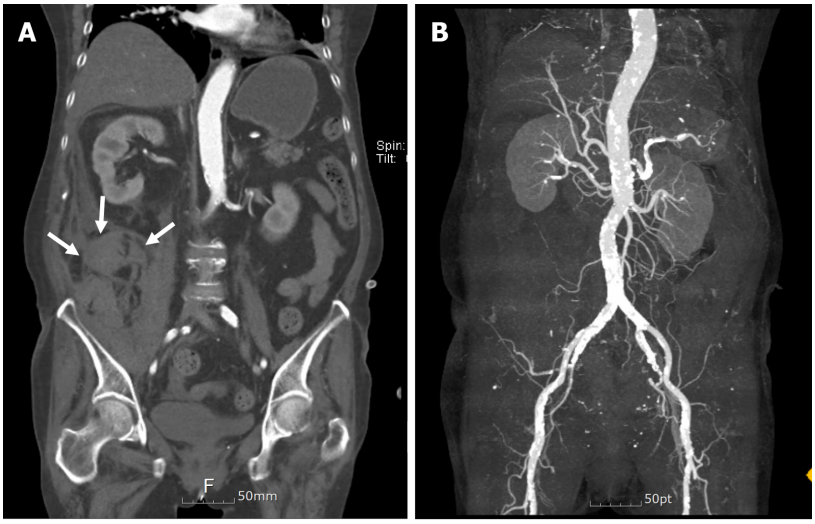


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**Figure 3 Computed tomography scans of the abdomen aorta.** A: Coronal image of the right retroperitoneal hemorrhage (arrows); B: Vascular reconstruction image showed no detected bleeding focus.

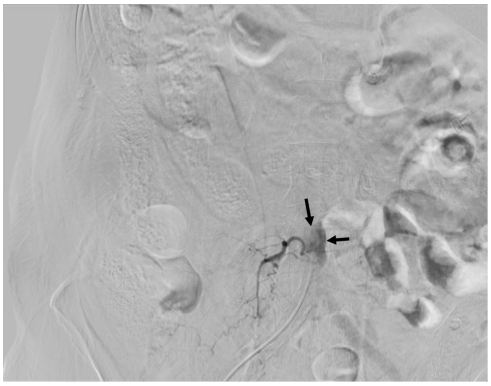

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**Figure 4 Arteriography showed the right 4th lumbar segmental artery rupture.** Arrows indicate blood leakage.

In the literature, patients have complained of flank pain and inguinal pain as symptoms of vessel injury. However, in our cases 1 patient complained of abdominal pain and 1 patient complained of flank pain. Of the 7 cases reported so far, only 2 cases on which angiography was performed could detect an accurate bleeding focus in a segmental artery. For the other 5 cases, both computed tomography and magnetic resonance imaging were performed. However, no bleeding focus was found because angiography was not performed. Of the 5 cases where no bleeding focus was found, 3 cases received conservative treatment and 2 cases underwent abdominal exploration (Table 1). In our 2 cases, a clear bleeding focus was found by angiography, and the bleeding was controlled successfully through emergency transarterial embolization. Therefore, when segmental artery rupture is suspected, angiography is helpful in finding the bleeding focus, and emergency embolization is considered an effective treatment method.

## CONCLUSION

We report 2 rare cases of segmental artery injury during transforaminal PELD. We were able to find the bleeding focus by angiography and treat the injury of the segmental artery successfully through emergency transarterial embolization.

**Table 1 Segmental artery injury during percutaneous endoscopic lumbar discectomy reported in the literature**

| Ref. | Age | Sex | HNP level | HNP operation | Symptom | Diagnosis | Treatment |
|---|---|---|---|---|---|---|---|
| Kim *et al*[8], 2009 | 60 | F | L4-5 | PELD | Flank and leg pain, hip flexion weakness, low BP | Psoas hematoma | Transfusion |
| Ahn *et al*[7], 2009 | 64 | M | L4-5 | Trans foraminal PELD | Inguinal and flank pain | Retroperitoneal hematoma | Retroperitoneal exploration |
| Ahn *et al*[7], 2009 | 31 | F | L4-5 | Trans foraminal PELD | Inguinal and thigh pain | Retroperitoneal hematoma | Paraspinal and retroperitoneal exploration |
| Ahn *et al*[7], 2009 | 34 | M | L4-5 | Trans foraminal PELD | Inguinal and thigh pain | Psoas hematoma | Conservative |
| Ahn *et al*[7], 2009 | 41 | F | L3-4, 4-5 | Trans foraminal PELD | Inguinal pain, hip flexion weakness | Retroperitoneal hematoma | Conservative |
| Wang *et al*[10], 2018 | 64 | F | L3-4 | Trans foraminal PELD | Intraoperative bleeding | Lumbar artery injury | Coil embolization |
| Panagiotopoulos *et al*[9], 2019 | 39 | M | L4-5 | Trans foraminal PELD | Flank pain | Segmental artery pseudoaneurysm | Coil embolization |

BP: Blood pressure; F: Female; M: Male; HNP: Herniation of nucleus pulposus; PELD: Percutaneous endoscopic lumbar discectomy.

## FOOTNOTES

**Author contributions:** Lee JS conceived the idea of the case report; Kim KW, Park HY, and Kim BH prepared the figures and collected the data; Cho WJ wrote the manuscript; All authors read and approved the final manuscript.

**Informed consent statement:** Both patients included in the present case series gave their consent prior to study inclusion.

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**Country/Territory of origin:** South Korea

**ORCID number:** Jun-Seok Lee 0000-0003-4321-9611.

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